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## An overview of infrared thermography in bovine reproduction

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### Abstract

Reproductive efficiency is a fundamental determinant of productivity and profitability in dairy and beef cattle enterprises. Timely estrus detection, accurate ovulation monitoring, early pregnancy diagnosis, prediction of parturition and efficient postpartum recovery are essential for optimizing reproductive performance. Conventional reproductive diagnostic techniques, including behavioural observation, rectal palpation, ultrasonography and hormonal assays are effective but often require skilled personnel, repeated animal handling, and considerable labour. Infrared thermography (IRT) has emerged as a rapid, non-invasive and animal-friendly imaging technology that measures naturally emitted infrared radiation from the body surface to detect physiological changes associated with blood circulation and metabolic activity. Thermal variations that accompany reproductive events, IRT has gained increasing attention as a complementary tool for reproductive monitoring in cattle. Recent studies have demonstrated its potential in estrus detection, ovulation prediction, pregnancy assessment, calving prediction and evaluation of postpartum reproductive health. Furthermore, advances in precision livestock farming, automated thermal imaging and artificial intelligence have enhanced the practical applicability of IRT for continuous herd monitoring. Although environmental conditions, animal-related factors and imaging protocols can influence thermographic measurements, standardized procedures and integration with conventional diagnostic methods substantially improve its reliability. This review summarizes the principles of infrared thermography and critically discusses its current applications, advantages, limitations and prospects in bovine reproductive management, highlighting its growing role in precision dairy farming.

**Keywords:** Infrared thermography, bovine reproduction, estrus detection, ovulation, pregnancy diagnosis, calving prediction, postpartum recovery, precision livestock farming.

### Introduction

Reproductive efficiency is an important determinant of productivity, profitability and sustainability in dairy cow production. Successful reproductive management includes accurate estrus detection, timely artificial insemination, early pregnancy diagnosis, parturition prediction and appropriate postpartum monitoring. However, reproductive performance is affected by many physiological, environmental and management factors, thus early detection of reproductive events and disorders is crucial for improving fertility and reducing economic losses (McManus *et al.*, 2016; Jeyakumar *et al.*, 2022) [9, 5]. Traditional reproductive diagnostic methods, including behavioral observation, rectal palpation, ultrasonography and hormonal assays, are still the cornerstones of bovine reproductive management; however, these methods often require skilled personnel, repeated handling of animals, special equipment, and intensive labor, which restrict them from being routinely applied in the field (Riaz *et al.*, 2023; Zheng *et al.*, 2022) [18, 27].

Recent advances in precision livestock husbandry have accelerated the use of non-invasive devices to monitor continuously animal health and reproductive. Infrared thermography (IRT) has emerged as a promising imaging technique for the detection of physiological changes associated with blood circulation, tissue metabolism and inflammation (McManus *et al.*, 2016; Zheng *et al.*, 2022) [9, 27]. Reproductive events such as estrus, ovulation, pregnancy, parturition

and postpartum recovery are accompanied by distinct changes in tissue perfusion and surface temperature, which provide a biological basis for the use of IRT in reproductive monitoring (Talukder *et al.*, 2014; Riaz *et al.*, 2023) <sup>[24, 18]</sup>. Moreover, the integration of thermal imaging into automated sensors, artificial intelligence and herd management systems has enhanced its utility as a decision-support tool for precision reproductive management (Fuentes *et al.*, 2022; Michelena *et al.*, 2025) <sup>[3, 12]</sup>. The paper provides a brief overview of the basics of infrared thermography and critically reviews its current uses, advantages, disadvantages and future potential in the control of bovine reproduction.

1. Fundamentals of infrared thermography in veterinary reproduction

Reproductive efficiency is essential for improving productivity and profitability in dairy and beef cattle. Conventional reproductive diagnostic methods, including behavioural observation, rectal palpation, ultrasonography and hormonal assays, are reliable but often require skilled personnel, repeated animal handling and considerable labour (Riaz *et al.*, 2023) <sup>[18]</sup>. Consequently, there is increasing interest in rapid, non-invasive technologies that can support reproductive management under field conditions. Infrared thermography (IRT) is a non-contact imaging technique that detects infrared radiation naturally emitted from the body surface and converts it into thermal images representing surface temperature (Zheng *et al.*, 2022) <sup>[27]</sup>. Because alterations in blood circulation and tissue metabolism are reflected as changes in skin temperature, IRT enables early detection of physiological events associated with reproduction (Jeyakumar *et al.*, 2022) <sup>[5]</sup>. Modern thermal cameras can detect very small temperature differences, making them suitable for monitoring subtle reproductive changes before obvious clinical signs become apparent (Schaefer *et al.*, 2007) <sup>[21]</sup>.

In cattle, reproductive hormones influence peripheral blood flow, resulting in measurable thermal changes during the estrous cycle, pregnancy and parturition. Increased estrogen concentrations during estrus promote vasodilation and elevate vulvar and perineal temperatures, whereas progesterone dominance during the luteal phase is generally associated with lower surface temperatures (Marquez *et al.*, 2022) <sup>[8]</sup>. These predictable thermal variations provide the biological basis for the application of IRT in estrus detection, ovulation monitoring, pregnancy assessment and calving prediction (Talukder *et al.*, 2014; Salles *et al.*, 2016) <sup>[24, 20]</sup>. The major advantages of IRT include its non-invasive nature, rapid image acquisition, absence of radiation exposure, minimal animal stress and suitability for repeated measurements (Sousa Pinto *et al.*, 2026) <sup>[22]</sup>. Integration of thermal imaging with precision livestock farming technologies, automated monitoring systems, and artificial intelligence has further enhanced its value for continuous herd surveillance (Michelena *et al.*, 2025) <sup>[12]</sup>. Despite these advantages, several factors can influence thermographic accuracy, including ambient temperature, humidity, wind speed, solar radiation, hair coat characteristics and imaging protocols. Therefore, standardized image acquisition and interpretation are essential and IRT should be considered a complementary rather than a

standalone diagnostic tool (Marchegiani *et al.*, 2023) <sup>[6]</sup>. With continuing advances in imaging technology and automated data analysis, infrared thermography is expected to play an increasingly important role in precision reproductive management and sustainable cattle production.

2. Infrared thermography for estrus detection, ovulation monitoring and pregnancy detection

Efficient estrus detection and timely insemination are essential for achieving optimal reproductive performance in cattle. Traditional methods such as visual observation of behavioural signs, activity monitoring, progesterone assays and ultrasonography are widely used but may be labour-intensive, require technical expertise, or fail to identify silent estrus. Infrared thermography (IRT) has emerged as a valuable complementary tool by detecting changes in skin surface temperature associated with hormonal fluctuations during the estrous cycle (Stewart *et al.*, 2005; McManus *et al.*, 2016) <sup>[23, 9]</sup>. During proestrus and estrus, increasing estrogen concentrations promote peripheral vasodilation and enhance blood flow to the reproductive tract, resulting in elevated temperatures of the vulva, perineum, tail-head region, and ocular area (Riaz *et al.*, 2023) <sup>[18]</sup>. Following ovulation, progesterone secretion from the corpus luteum induces a gradual decline in surface temperature. These cyclic thermal changes provide a physiological basis for identifying estrus and estimating the optimal time for artificial insemination. Successful reproductive management depends not only on accurate estrus detection but also on timely artificial insemination using appropriate breeding strategies to maximize conception rates (Praveen *et al.*, 2024b) <sup>[15]</sup>. Several studies have reported that vulvar temperature increases by approximately 0.3–1.0°C during estrus, demonstrating a positive correlation with behavioural estrus and ovulation (Talukder *et al.*, 2014; Salles *et al.*, 2016) <sup>[24, 20]</sup>. Infrared thermography has also been investigated as a non-invasive aid for ovulation monitoring. Ovulation is accompanied by endocrine and vascular changes that influence local tissue perfusion, producing characteristic thermal patterns detectable by high-resolution infrared cameras. Although IRT cannot directly visualize ovarian structures like ultrasonography, combining thermal imaging with behavioural observations or automated activity monitoring can improve the accuracy of ovulation prediction and insemination timing (Marquez *et al.*, 2021) <sup>[7]</sup>. Pregnancy diagnosis represents another promising application of IRT. Following conception, increased uterine blood flow, fetal development and endocrine adaptations alter body surface temperature. Studies have demonstrated significant thermal differences in pregnant and non-pregnant cows, particularly around the ventral abdomen, mammary gland, and ocular region (Wang *et al.*, 2020; Riaz *et al.*, 2024) <sup>[26, 19]</sup>. While these findings suggest that thermal imaging may support early pregnancy assessment, diagnostic accuracy remains variable due to environmental influences and individual animal variation. Therefore, IRT should currently be regarded as a complementary technique rather than a replacement for ultrasonography or pregnancy-associated glycoprotein assays (Riaz *et al.*, 2023) <sup>[18]</sup>. Some of the applications of bovine IRT is listed in table 1.

Table 1: Application of bovine IRT and its practical significance

| Application            | Thermal Changes                                     | Practical significance                                                                                                |
|------------------------|-----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|
| Estrus detection       | Increased vulvar and ocular temperature             | Detects heat and silent estrus (Riaz <i>et al.</i> , 2023) <sup>[18]</sup> .                                          |
| Ovulation monitoring   | Peak temperature during estradiol peak and LH surge | Determines optimal insemination time (Salles <i>et al.</i> , 2016; Marquez <i>et al.</i> , 2021) <sup>[20, 7]</sup> . |
| Pregnancy assessment   | Increased abdominal and udder temperature.          | Supports pregnancy diagnosis and monitoring (Riaz <i>et al.</i> , 2024) <sup>[19]</sup> .                             |
| Gestational monitoring | Maternal-foetal thermal interactions                | Assess foetal development and maternal health (Wang <i>et al.</i> , 2020) <sup>[26]</sup>                             |

Recent advances in automated thermal cameras, image-processing software, artificial intelligence and precision livestock farming have significantly enhanced the practical application of infrared thermography for reproductive monitoring (Fuentes *et al.*, 2023) <sup>[3]</sup>. Continuous thermal surveillance integrated with wearable sensors and herd management systems allows early identification of estrus, improves breeding efficiency and reduces dependence on subjective visual observations (Merkelyte *et al.*, 2025) <sup>[10]</sup>. Nevertheless, standardized imaging protocols and careful control of environmental factors such as ambient temperature, humidity, solar radiation and camera positioning are essential to ensure reliable interpretation of thermographic data. Overall, infrared thermography offers considerable potential as a rapid, non-invasive and welfare-friendly tool for improving estrus detection, ovulation monitoring and reproductive decision-making in modern cattle production systems.

### 3. Infrared thermography around parturition and calving prediction in cattle

Timely prediction of parturition is essential for reducing calving-related complications, minimizing neonatal mortality and ensuring appropriate obstetrical assistance in dairy and beef cattle. Conventional approaches, including observation of behavioural changes, pelvic ligament relaxation, udder development, vaginal discharge and hormonal profiling, are commonly used to estimate the onset of calving. However, these indicators are often subjective, labour-intensive and may not accurately predict the precise time of parturition. Infrared thermography (IRT) has emerged as a promising, non-invasive technique for monitoring physiological temperature changes associated with the prepartum period (Stewart *et al.*, 2005; McManus *et al.*, 2016) <sup>[23, 9]</sup>.

As parturition approaches, endocrine changes, particularly a decline in progesterone and a rise in estrogen and prostaglandins, alter peripheral blood circulation and thermoregulation. These hormonal events result in measurable changes in body surface temperature that can be detected by infrared cameras. Studies have demonstrated a gradual reduction in temperatures of the vulva, tail-head, udder and ocular region approximately 12–48 hours before calving, followed by dynamic thermal changes during labour and immediately after parturition and the change in temperature by IRT is depicted in figure 1 (Metzner *et al.*, 2014; Radigonda *et al.*, 2017; Mota-Rojas *et al.*, 2021) <sup>[11, 17, 13]</sup>. Among various anatomical sites, the vulvar and tail-head regions have shown promise for calving prediction because they reflect vascular and physiological changes occurring in the reproductive tract. Similarly, ocular temperature has been used as an indicator of stress and thermoregulatory responses during the periparturient period (Church *et al.*, 2014) <sup>[2]</sup>. Continuous monitoring of these thermal patterns can assist farmers and veterinarians in identifying animals approaching calving, allowing timely movement to maternity pens and appropriate supervision during delivery (Marquez *et al.*, 2022) <sup>[8]</sup>. Infrared thermography also contributes to improving neonatal survival and maternal welfare by facilitating early intervention in cases of dystocia or prolonged labour. Prompt

obstetrical assistance reduces the risk of fetal hypoxia, postpartum complications and economic losses associated with difficult calvings. Furthermore, because thermal imaging is rapid, non-contact and does not disturb the animal, it is particularly suitable for routine monitoring during the critical prepartum period.

Despite its considerable potential, several factors influence the accuracy of thermographic measurements during calving prediction. Environmental temperature, humidity, wind speed, solar radiation, hair coat condition and camera positioning can affect surface temperature recordings. Consequently, standardized imaging protocols and repeated observations are essential for obtaining consistent results. At present, IRT is best utilized as a complementary tool alongside behavioural observations and conventional reproductive monitoring rather than as a standalone predictor of parturition. With advances in automated thermal imaging, artificial intelligence and precision livestock farming technologies, infrared thermography is expected to become an increasingly valuable component of calving management, improving animal welfare, reproductive efficiency and herd productivity.

### 4. Infrared thermography and postpartum reproductive recovery in cattle: current applications and future perspectives

The postpartum period is a critical phase in bovine reproduction, during which rapid uterine involution, ovarian cyclicity, and restoration of reproductive function determine the interval to subsequent conception. Delayed uterine recovery and postpartum disorders such as retained fetal membranes, metritis, endometritis and ovarian dysfunction adversely affect fertility and result in significant economic losses. Early identification of these conditions is therefore essential for improving reproductive efficiency in dairy and beef herds (McManus *et al.*, 2016; Riaz *et al.*, 2023) <sup>[9, 18]</sup>. Infrared thermography (IRT) has gained increasing attention as a non-invasive tool for monitoring postpartum reproductive health by detecting alterations in body surface temperature associated with inflammation and tissue perfusion. Animals affected by uterine infections or delayed involution often exhibit localized increases in temperature around the perineal, vulvar and abdominal regions due to enhanced blood flow and inflammatory responses. These thermal changes may be detected before obvious clinical signs appear, enabling earlier diagnosis and timely therapeutic intervention (Mota-Rojas *et al.*, 2021; Perez-Marquez *et al.*, 2022) <sup>[13, 8]</sup>. In indigenous *Bos indicus* cattle, reproductive performance is strongly influenced by nutritional status, particularly body condition score (BCS), climatic stress and management practices (Praveen *et al.*, 2024a) <sup>[14]</sup>. Infrared thermography offers advantages in these production systems because it allows rapid, contact-free evaluation of reproductive status with minimal handling of animals. Thermal imaging can be incorporated into routine herd health programmes to monitor postpartum recovery, identify animals requiring clinical examination and support reproductive decision-making while minimizing stress and labour requirements (Talukder *et al.*, 2014) <sup>[24]</sup>.

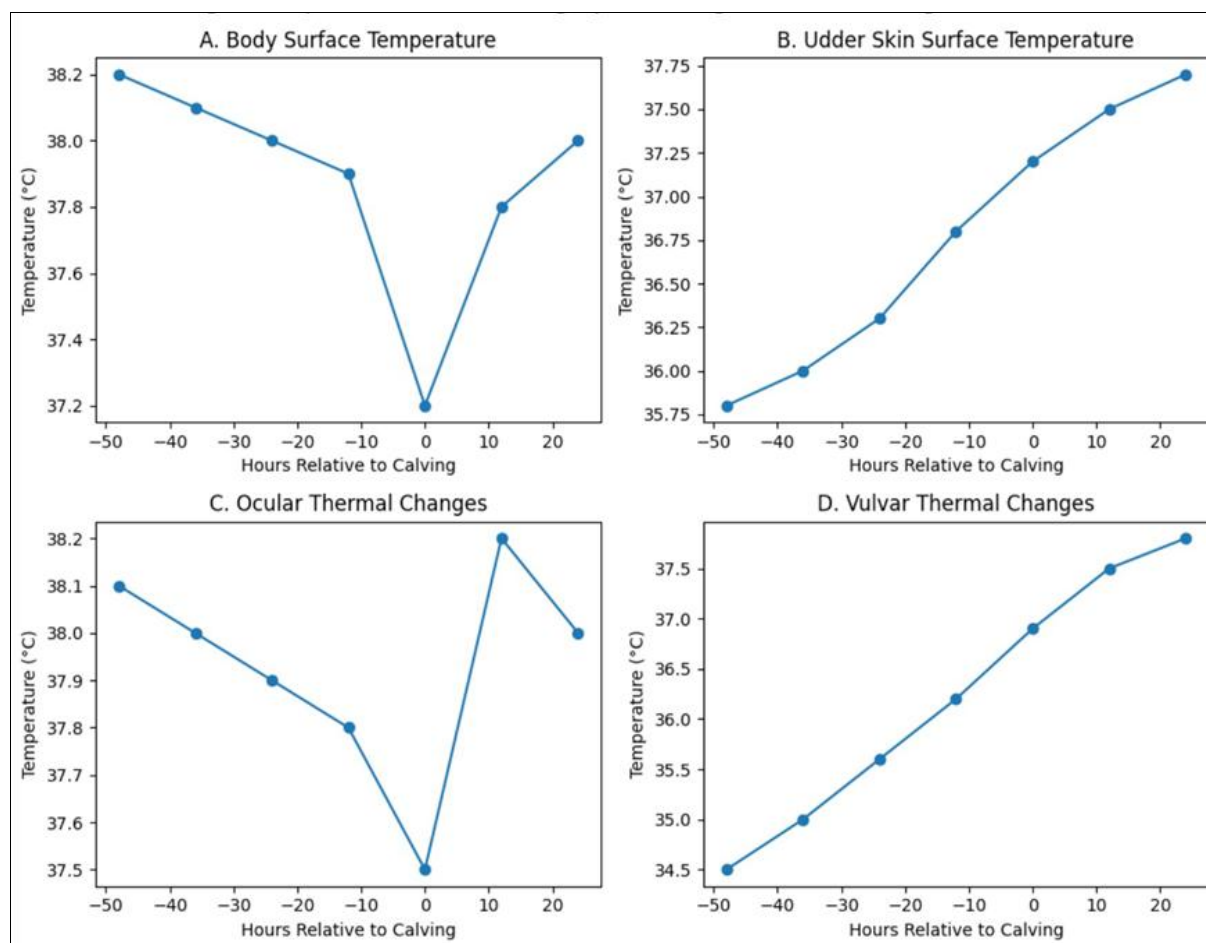


**Fig 1:** Thermographic changes in body surface, udder, ocular and vulvar temperatures relative to calving. Adapted from Mota-Rojas *et al.*

Recent advances in precision livestock farming have expanded the applications of IRT beyond disease detection. Automated thermal cameras integrated with artificial intelligence, machine learning algorithms, wearable sensors and cloud-based herd management systems enable continuous monitoring of reproductive status and early detection of abnormalities (Jamra *et al.*, 2025; Vithalrao *et al.*, 2025; Abbas *et al.*, 2026) [4, 25, 1]. Such integrated technologies have the potential to improve reproductive efficiency, reduce economic losses, enhance animal welfare and facilitate data-driven reproductive management under both intensive and extensive production systems (Pritom *et al.*, 2026) [16]. However, these promising developments, several limitations remain. Environmental conditions, hair coat characteristics, image acquisition protocols and camera calibration can influence thermographic measurements, necessitating standardized operating procedures for reliable interpretation. Moreover, IRT should be considered a complementary diagnostic tool rather than a replacement for conventional reproductive examinations such as ultrasonography and laboratory-based diagnostic tests. Future research should focus on establishing species-specific reference values, validating automated image analysis systems and integrating thermal imaging with other precision livestock technologies. With continued technological advancements, infrared thermography is expected to become an important component of precision reproductive management, contributing to improved fertility, enhanced animal welfare and sustainable cattle production.

## Conclusion

Infrared thermography is a rapid, non-invasive imaging

technique with considerable potential for improving bovine reproductive management. It provides valuable support for estrus detection, ovulation monitoring, pregnancy assessment, calving prediction and postpartum reproductive monitoring by identifying physiological changes in body surface temperature. Although environmental and animal-related factors can affect thermographic measurements, standardized imaging protocols can substantially improve its reliability. Rather than replacing conventional diagnostic methods, IRT should be used as a complementary tool to enhance reproductive decision-making. Continued advances in automated thermal imaging, artificial intelligence and precision livestock farming are expected to further strengthen its role in sustainable cattle reproduction.

## Conflict of Interest

Not available

## Financial Support

Not available

## References

1. Abbas M, Abbas G, Jaffery S, Chuanqiang Z, Yunxia L, Gaoping Z, *et al.* Smart dairy farming: Enhanced efficiency, productivity and animal welfare through the Internet of Things and cloud integration. *JAPS: Journal of Animal & Plant Sciences*. 2025;35(1).
2. Church JS, Hegadoren PR, Paetkau MJ, Miller CC, Regev-Shoshani G, Schaefer AL, *et al.* Influence of environmental factors on infrared eye temperature measurements in cattle. *Research in Veterinary Science*. 2014;96(1):220-226.

3. Fuentes S, Viejo CG, Tongson E, Dunshea FR. The livestock farming digital transformation: Implementation of new and emerging technologies using artificial intelligence. *Animal Health Research Reviews*. 2022;23(1):59-71.
4. Jamra MS, Jamra N, Rawat NS, Yadav DS. Precision livestock farming. Delhi: Addition Publishing House; 2025.
5. Jeyakumar S, Kumaresan A, Kataktalware MA, Manimaran A, Ramesha KP. Infrared thermal imaging and its application in animal reproduction. In: *Frontier Technologies in Bovine Reproduction*. Singapore: Springer Nature Singapore; 2022. p. 47-64.
6. Marchegiani S, Gislon G, Marino R, Caroprese M, Albenzio M, Pinchak WE, *et al.* Smart technologies for sustainable pasture-based ruminant systems: A review. *Smart Agricultural Technology*. 2025;10:100789.
7. Marquez HP, Ambrose DJ, Schaefer AL, Cook NJ, Bench CJ. Evaluation of infrared thermography combined with behavioral biometrics for estrus detection in naturally cycling dairy cows. *Animal*. 2021;15(7):100205.
8. Marquez HP, Schaefer AL, von Gaza H, Ambrose DJ, Cook NJ, Bench CJ. Evaluating automated infrared thermography and vulva exposure tracking as components of an estrus detection platform in a commercial dairy herd. *Animal*. 2022;16(8):100585.
9. McManus C, Tanure CB, Peripolli V, Seixas L, Fischer V, Gabbi AM, *et al.* Infrared thermography in animal production: An overview. *Computers and Electronics in Agriculture*. 2016;123:10-16.
10. Merkelyte I, Šiukščiū A, Nainienė R. The role of sensor technologies in estrus detection in beef cattle: A review of current applications. *Animals*. 2025;15(15):2313.
11. Metzner M, Sauter-Louis C, Seemueller A, Petzl W, Klee W. Infrared thermography of the udder surface of dairy cattle: Characteristics, methods, and correlation with rectal temperature. *The Veterinary Journal*. 2014;199(1):57-62.
12. Michelen A, Fontenla-Romero Ó, Luis Calvo-Rolle J. A review and future trends of precision livestock over dairy and beef cow cattle with artificial intelligence. *Logic Journal of the IGPL*. 2025;33(4):jzae111.
13. Mota-Rojas D, Pereira AM, Wang D, Martínez-Burnes J, Ghezzi M, Hernández-Avalos I, *et al.* Clinical applications and factors involved in validating thermal windows used in infrared thermography in cattle and river buffalo to assess health and productivity. *Animals*. 2021;11(8):2247.
14. Praveen KS, Manjula RG, Swetha T, Deepthipriya B, Revathi N, Rao MM. An update on body condition scoring (BCS) system in cattle production and reproduction management. *International Journal of Veterinary Sciences and Animal Husbandry*. 2024;9(5):219-220.
15. Praveen KS, Radhika V, Chandrika T, Srihari J, Manoranjan I, Srikanth NR, *et al.* Artificial insemination in cattle and buffalo: An update. *International Journal of Veterinary Sciences and Animal Husbandry*. 2024;9:221-225.
16. Pritom MM, Modak M, Banik SC, Rabbi MS. Exploring IoT approaches to cattle disease detection: Review on advancements and challenges. *The Journal of Engineering*. 2026;2026(1):e70203.
17. Radigonda VL, Pereira GR, da Cruz Favaro P, Barca Júnior FA, Borges MHF, Galdioli VH, *et al.* Infrared thermography relationship between the temperature of the vulvar skin, ovarian activity, and pregnancy rates in Braford cows. *Tropical Animal Health and Production*. 2017;49(8):1787-1791.
18. Riaz U, Idris M, Ahmed M, Ali F, Yang L. Infrared thermography as a potential non-invasive tool for estrus detection in cattle and buffaloes. *Animals*. 2023;13(8):1425.
19. Riaz U, Idris M, Ahmed M, Ali F, Farooq U, Yang L. The potential of infrared thermography for early pregnancy diagnosis in Nili-Ravi buffaloes. *Animals*. 2024;14(13):1966.
20. Salles MSV, da Silva SC, Salles FA, Roma Jr LC, El Faro L, Mac Lean PAB, *et al.* Mapping the body surface temperature of cattle by infrared thermography. *Journal of Thermal Biology*. 2016;62:63-69.
21. Schaefer AL, Cook NJ, Church JS, Basarab J, Perry B, Miller C, *et al.* The use of infrared thermography as an early indicator of bovine respiratory disease complex in calves. *Research in Veterinary Science*. 2007;83(3):376-384.
22. Sousa Pinto V, Vilela LGP, de Souza IMF, Sousa CEL, da Silva TN, Souza ADS, *et al.* Use of infrared thermography in assessing the thermal comfort of cattle: Systematic review. *Frontiers in Veterinary Science*. 2026;13:1788172.
23. Stewart M, Webster JR, Schaefer AL, Cook NJ, Scott SL. Infrared thermography as a non-invasive tool to study animal welfare. *Animal Welfare*. 2005;14(4):319-325.
24. Talukder S, Kerrisk KL, Ingenhoff L, Thomson PC, Garcia SC, Celi P. Infrared technology for estrus detection and as a predictor of time of ovulation in dairy cows in a pasture-based system. *Theriogenology*. 2014;81(7):925-935.
25. Vithalrao US, Verma K, Mahanthesh MT, Sreedhara JN, Shende RB, Singh AK, *et al.* A review of the impact of smart sensors and IoT on modern livestock production management. *Archives of Current Research International*. 2025;25(12):551-564.
26. Wang S, Zhang H, Kou H, Chen X, Lu Y, Li L, *et al.* Early pregnancy diagnoses based on physiological indexes of dairy cattle: A review. *Tropical Animal Health and Production*. 2020;52(5):2205-2212.
27. Zheng S, Zhou C, Jiang X, Huang J, Xu D. Progress on infrared imaging technology in animal production: A review. *Sensors*. 2022;22(3):705.

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